Investigating the use of Mid Infrared spectral data to predict dairy cow cellular immune traits

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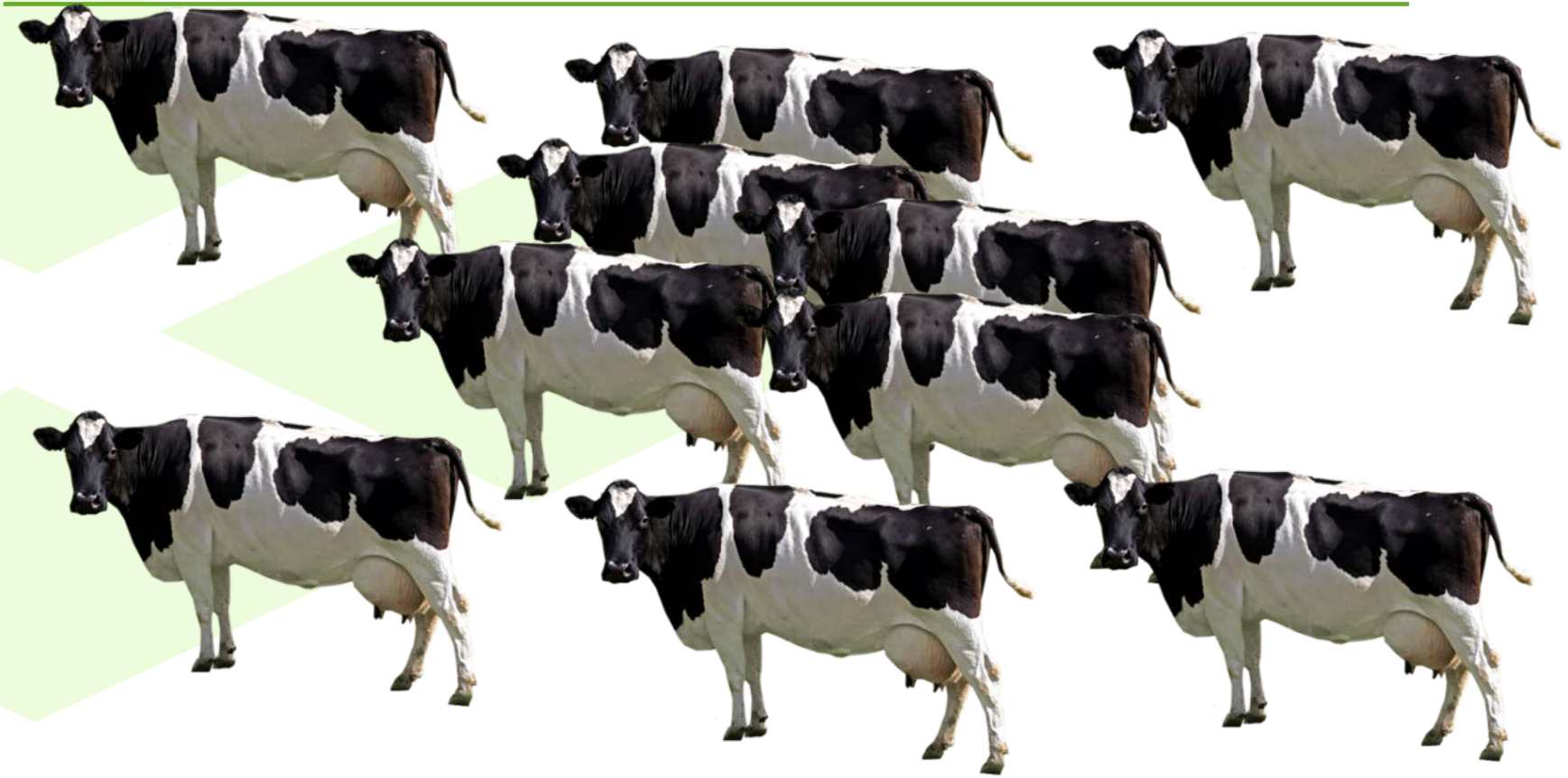
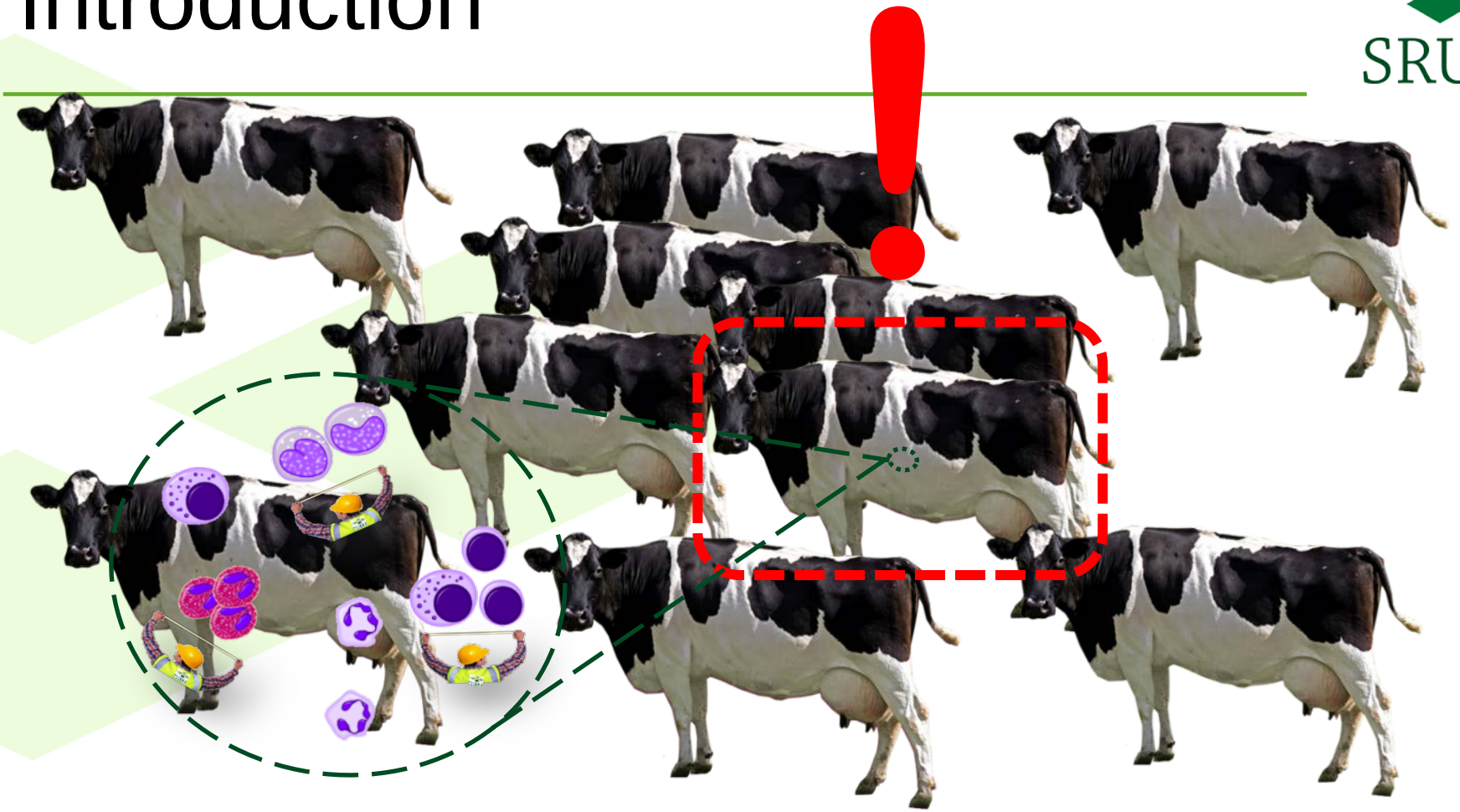
Introduction

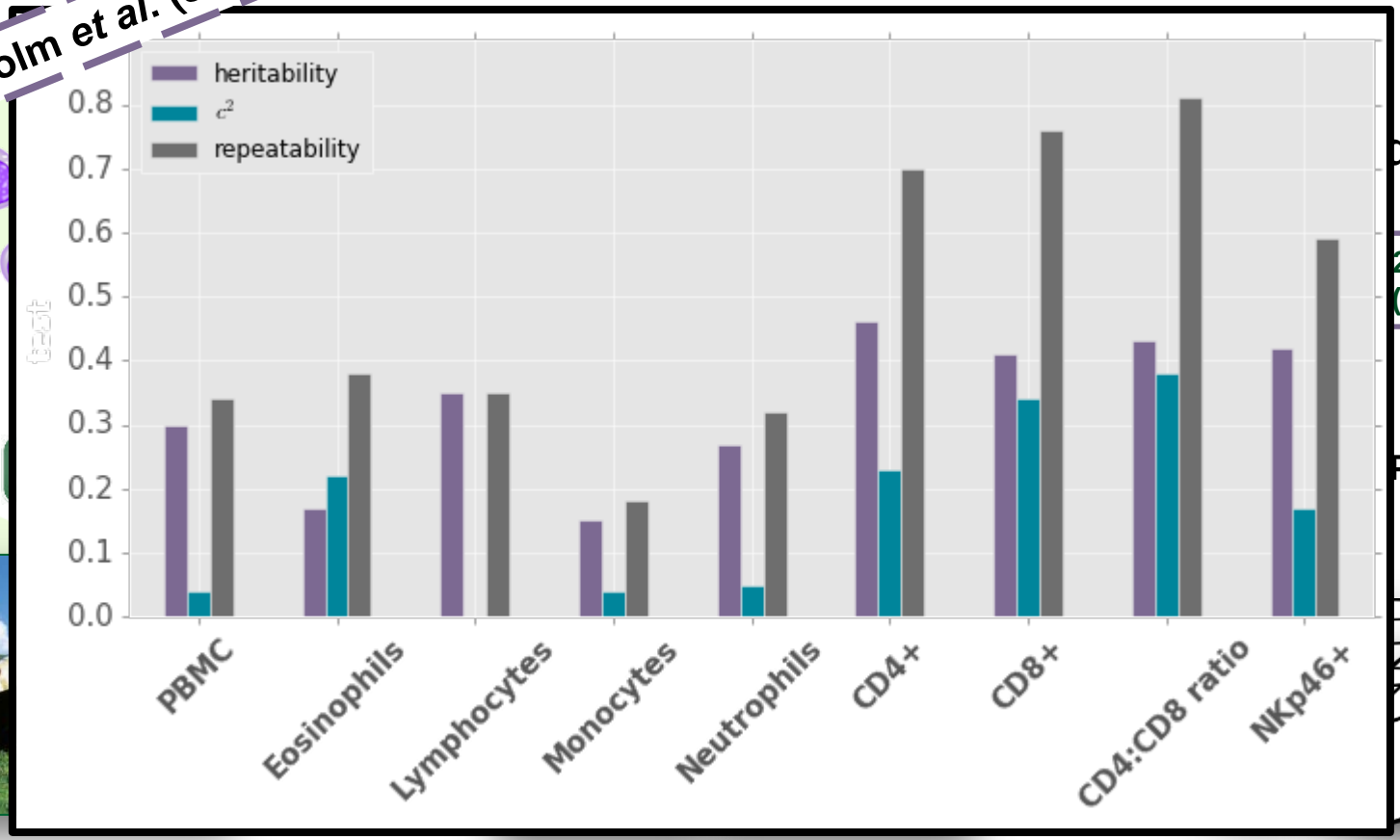


Introduction



Introduction

Denholm *et al.* (subm)



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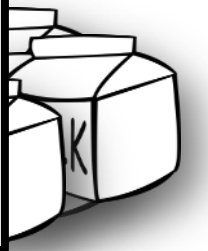
2013)
(*subm*)

Production[1, 2]



Mid infrared (MIR) spectroscopy of milk samples

- Ins
- Ro
-

De Marchi et al.,2014

INVITED REVIEW: PHENOTYPING OF MILK BY MID-INFRARED SPECTROSCOPY 1173

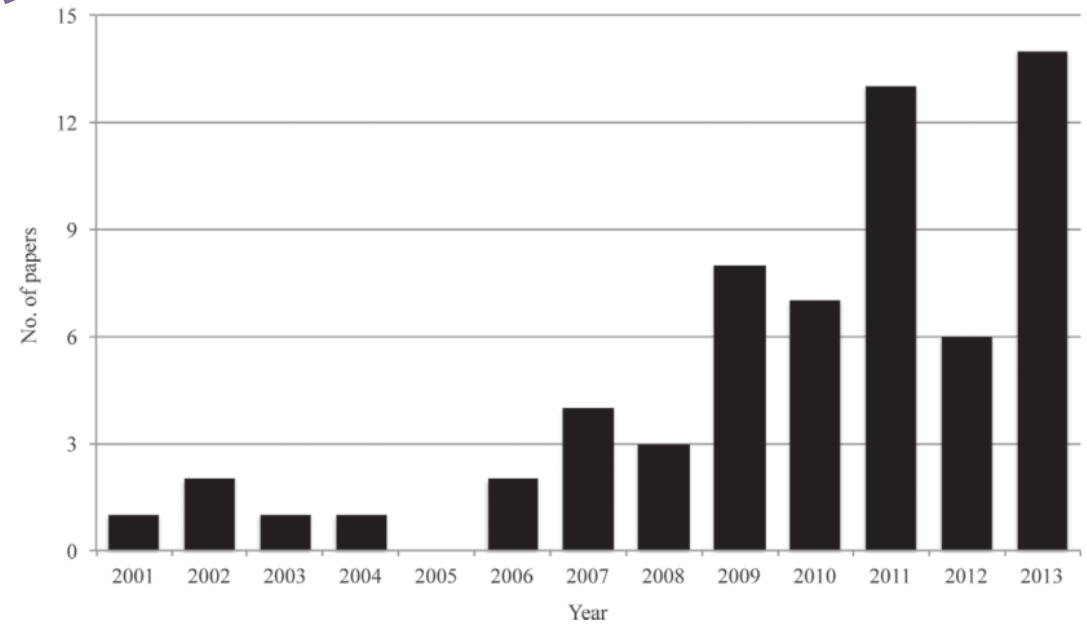


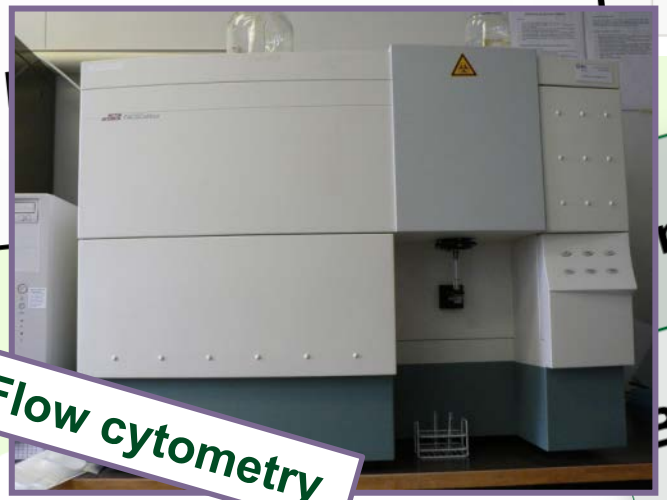
Figure 2. Published papers (retrieved from ISI Web of Science; http://thomsonreuters.com/web-of-science/) on mid-infrared spectroscopy (MIRS) and milk. For 2013, papers published up to October are reported.

Cellular IA trait sampling

- 357 Holstein-Friesian dairy cows
-

2013 - 2015

12 bi-monthly Sampling periods



Flow cytometry

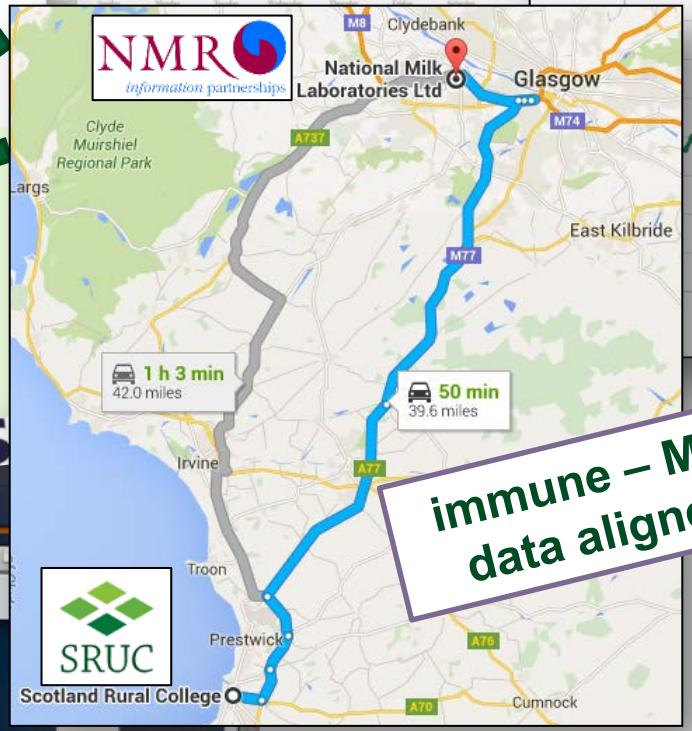
	Control	Select
megrown	79	96
Byproducts	97	85

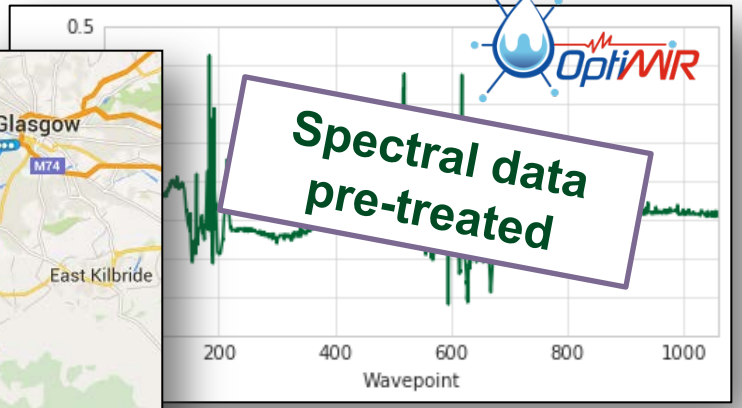
CYTE

Monocytes

Routine milk sampling

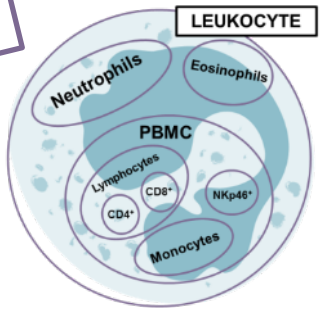
2013 - 2015



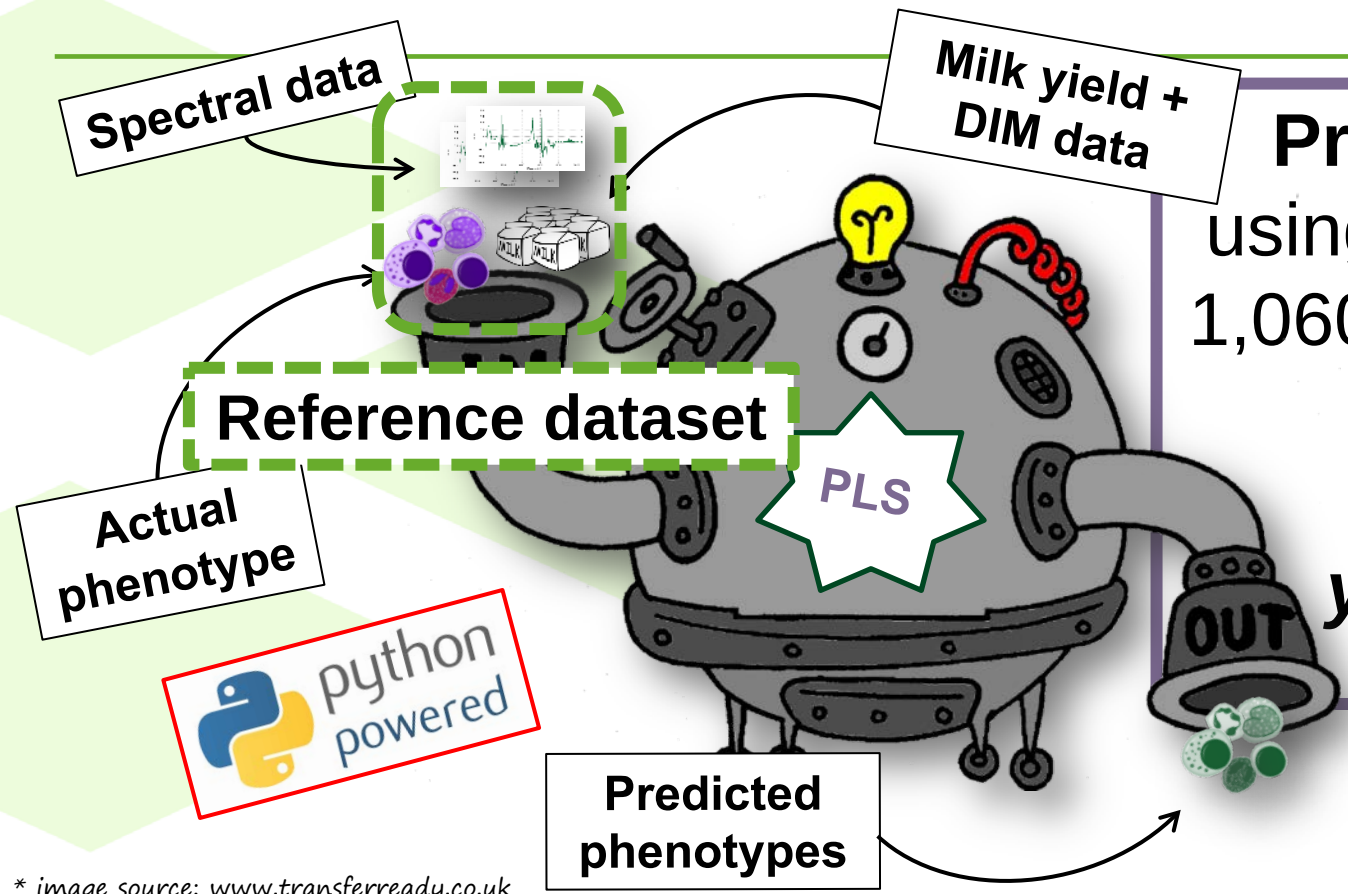


Spectral data pre-treated

immune – MIR data aligned



Calibration & validation



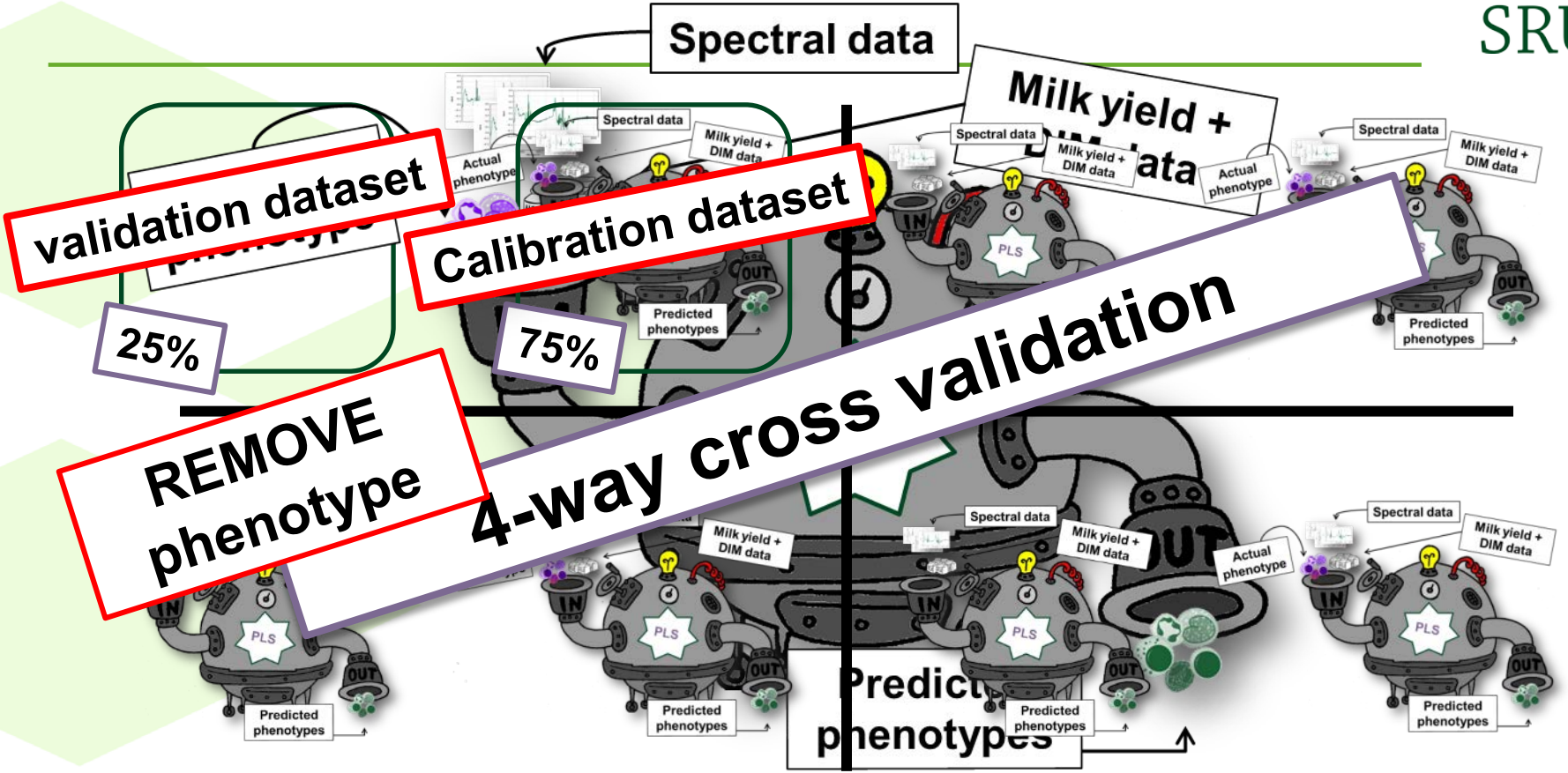
Predict traits using spectrum of 1,060 wavelengths via **PLS:**

$$y = Xb + e$$

Builds on methods initially developed by McParland et al. 2011

* image source: www.transferready.co.uk

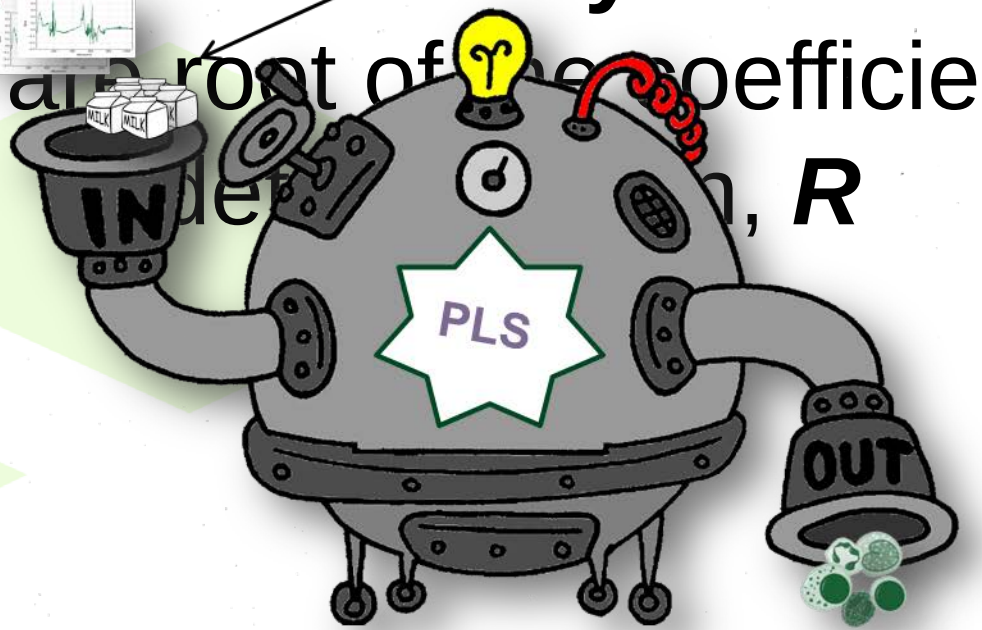
Calibration & validation



* image source: www.transferready.co.uk

Prediction and accuracy

Prediction accuracy determined via square root of the coefficient of determination, ***R***



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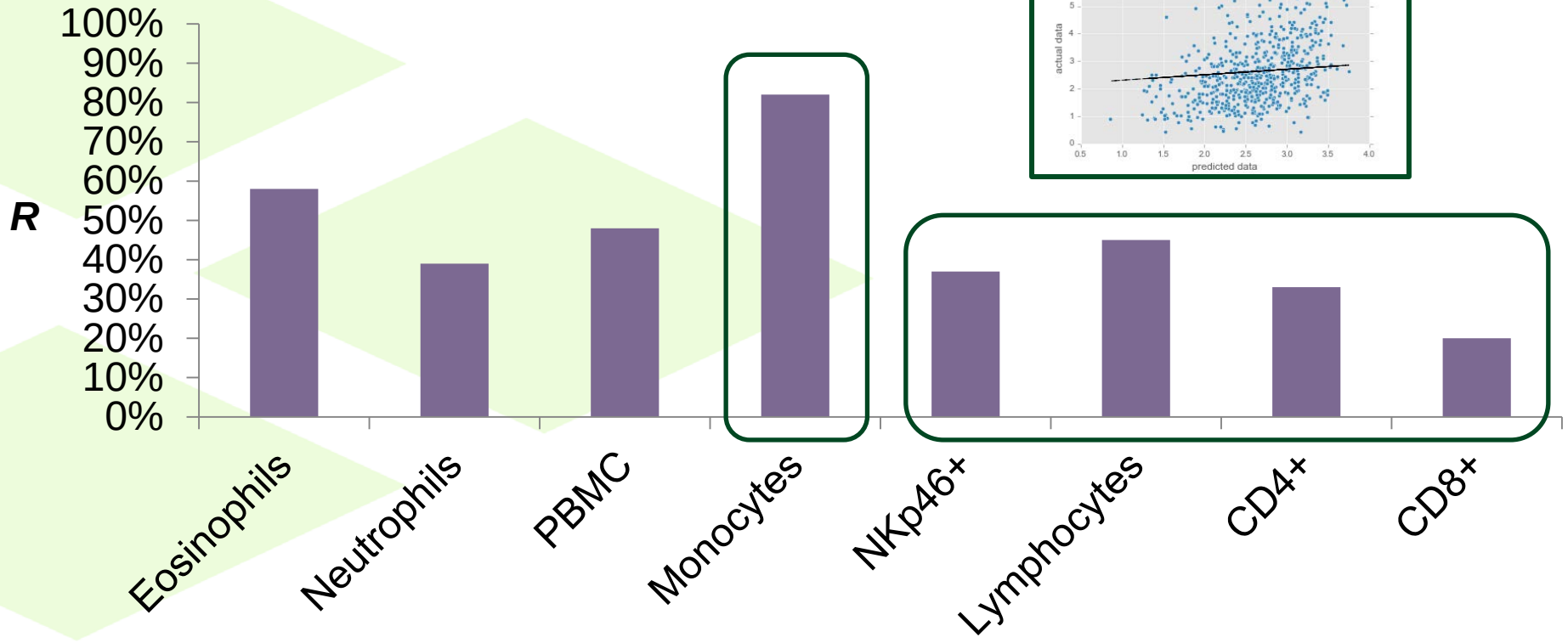
Prediction accuracy



Methods for increasing accuracy

- For example:
  - Data thinning (e.g., Grelet et al., 2016)
  - Reference data transformation
  - Definition of outliers based on residuals

Conclusions

- Predicting cellular IA traits from MIRS promising
- Further research required to:
  - improve prediction accuracy
  - extend to serological IA traits
  - highlight practicality of MIR-predicted IA traits to dairy industry

Acknowledgements

SRUC

All Crichton Farm staff and technicians involved in the collection of data

BBSRC bioscience for the future

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Mairi Mitchell
Ainsley Bagnall

Investing in Opportunities
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INTERREG IVB

NMR information partnerships

NML national milk laboratories

OptiNIR

The Scottish Government
Riaghaltas na h-Alba

Innovate UK
Technology Strategy Board

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Thanks for listening!

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